

What is claimed is:

1. A substrate processing method, comprising the steps of:
forming an interlayer insulating film on a substrate; and
irradiating the interlayer insulating film on the substrate with electron
5 beams in a processing chamber to cure the interlayer insulating film.
2. The substrate processing method as set forth in claim 1, wherein
in said step of curing the interlayer insulating film, the substrate is
heated to a predetermined temperature.
3. The substrate processing method as set forth in claim 1, wherein
10 said step of curing the interlayer insulating film is performed in a
reduced oxygen atmosphere with an oxygen concentration lower than that of
at least an atmospheric air.
4. The substrate processing method as set forth in claim 1, wherein
said step of forming the interlayer insulating film comprises a step of
15 coating the substrate with a coating solution which becomes the interlayer
insulating film; and
between said coating step and said step of curing the interlayer
insulating film, a pre-heating step of heating the substrate is performed.
5. The substrate processing method as set forth in claim 1, further
20 comprising:
a post-heating step of heating the substrate after said step of curing the
interlayer insulating film.
6. The substrate processing method as set forth in claim 1, further
comprising: the step of
25 generating plasma in the processing chamber after irradiating with the
electron beams to cure the interlayer insulating film.

7. The substrate processing method as set forth in claim 2, wherein the reduced oxygen atmosphere is created by replacing at least an atmosphere around the substrate with a gas of molecular weight lower than that of oxygen.
- 5 8. The substrate processing method as set forth in claim 2, wherein the reduced oxygen atmosphere is created by reducing a pressure in the processing chamber.
9. The substrate processing method as set forth in claim 4, wherein a period of time between completion of said pre-heating step and 10 irradiation of the substrate with the electron beams is controlled to be constant.
10. The substrate processing method as set forth in claim 4, wherein said pre-heating is performed at a temperature lower than a temperature of the substrate in said step of curing the interlayer insulating 15 film.
11. The substrate processing method as set forth in claim 5, wherein said post-heating is performed at a temperature higher than the temperature of the substrate in said step of curing the interlayer insulating film.
- 20 12. The substrate processing method as set forth in claim 6, wherein the plasma is generated by irradiation with the electron beams.
13. The substrate processing method as set forth in claim 6, wherein the plasma is generated by supply of high-frequency power.
14. A substrate processing method, comprising the steps of: 25 repeating both a coating step of coating a substrate with a coating solution which becomes an interlayer insulating film and a pre-heating step of

heating the substrate after said coating step; and

after a final coating step, irradiating a plurality of interlayer insulating films on the substrate with electron beams in a processing chamber to concurrently cure the plurality of interlayer insulating films.

5 15. A substrate processing method, comprising the steps of:

forming an insulating film on a substrate by a CVD process; and

irradiating the insulating film on the substrate with electron beams in a processing chamber to process the insulating film.

16. The substrate processing method as set forth in claim 15, wherein

10 the substrate is heated to 200°C or higher in said step of processing the insulating film.

17. The substrate processing method as set forth in claim 15, further comprising:

15 a post-heating step of heating the substrate after said step of irradiating with electron beams to process the insulating film.

18. The substrate processing method as set forth in claim 15, further comprising: the step of

generating plasma in the processing chamber after irradiating with the electron beams to process the insulating film.

20 19. A substrate processing apparatus, comprising:

a first processing section having a coating unit for coating a substrate with a coating solution which becomes an insulating film;

a second processing section having a curing processing unit for curing the insulating film on the substrate by irradiating the substrates one by one 25 with electron beams; and

a carrier mechanism for carrying the substrate between said first

processing section and said second processing section.

20. The substrate processing apparatus as set forth in claim 19, wherein said curing processing unit includes a grid electrode between a mounting table on which the substrate is mounted and a device for irradiating with the electron beams.
21. The substrate processing apparatus as set forth in claim 19, wherein said curing processing unit includes a mounting table on which the substrate is mounted, and said mounting table is capable of applying a reverse bias voltage to the substrate.
- 10 22. The substrate processing apparatus as set forth in claim 19, wherein said curing processing unit is structured so that the pressure in said curing processing unit is allowed to be reduced.
23. The substrate processing apparatus as set forth in claim 19, wherein said first processing section includes a heating processing unit for subjecting the substrate coated with the coating solution to heating processing.
- 15 24. The substrate processing apparatus as set forth in claims 19, wherein said first processing section further includes a resist coating unit for coating the substrate with a resist solution and a developing unit for subjecting the substrate to developing treatment,
- 20 an exposure processing unit for exposing the substrate is provided in an area where the substrate is allowed to be carried by said carrier mechanism.
25. The substrate processing apparatus as set forth in claims 19, further comprising:
 - a carrier chamber housing said carrier mechanism and being

hermetically closable; and

a pressure reducing mechanism for reducing the pressure in said carrier chamber to a predetermined pressure.

26. The substrate processing apparatus as set forth in claims 19, wherein

5 the pressure in said second processing section is allowed to be reduced.

27. The substrate processing apparatus as set forth in claims 19, further comprising:

10 a reduced pressure chamber housing said carrier mechanism and said second processing section and being hermetically closable; and

a pressure reducing mechanism for reducing the pressure in said reduced pressure chamber to a predetermined pressure.

28. The substrate processing apparatus as set forth in claims 19, wherein

15 a thermal processing unit for subjecting the substrate to thermal processing is provided in said second processing section.

29. The substrate processing apparatus as set forth in claim 24, wherein

an etching unit for subjecting the substrate to etching processing in a reduced pressure atmosphere is provided in said second processing section.

30. A substrate processing apparatus, comprising:

20 a first processing section having a CVD unit for forming an insulating film on a substrate by a CVD process;

a second processing section having a curing processing unit for curing the insulating film on the substrate by irradiating the substrates one by one with electron beams; and

25 a carrier mechanism for carrying the substrate between said first processing section and said second processing section.